

NRC Medium Voltage Circuit Breaker Training



CHAPTER 7

**INTRODUCTION TO
WESTINGHOUSE DHP CIRCUIT
BREAKERS**

Learning Objectives



- How the DHP breakers are classed or grouped.
- How the breaker frame size method further identifies the breaker.
- The component attributes of the DHP breaker:
 - Operating mechanism
 - Primary contacts, pole unit bases
 - Control panel with electrical devices including wiring
 - Mechanical and safety interlocks
 - Puffer Assembly
 - Levering-In Device
- Basic understanding of common failure modes of DHP Breakers.
- Basic understanding of subcomponent replacement.
- Basic understanding of design upgrades for the DHP breakers.
- Using the work shop attachment 7A to understand proper lubrication for DHP breaker.
- Using the work shop attachment 7A to understand preventative maintenance for the DHP circuit breaker

Pole Unit Bases Insulators



There were two versions of primary insulators used on DHP's

- Monolithic -Original insulator type
- Post Insulated Pole (PIP) – Newer design

Pole Unit Bases Insulators



- Post Insulated Pole (PIP)

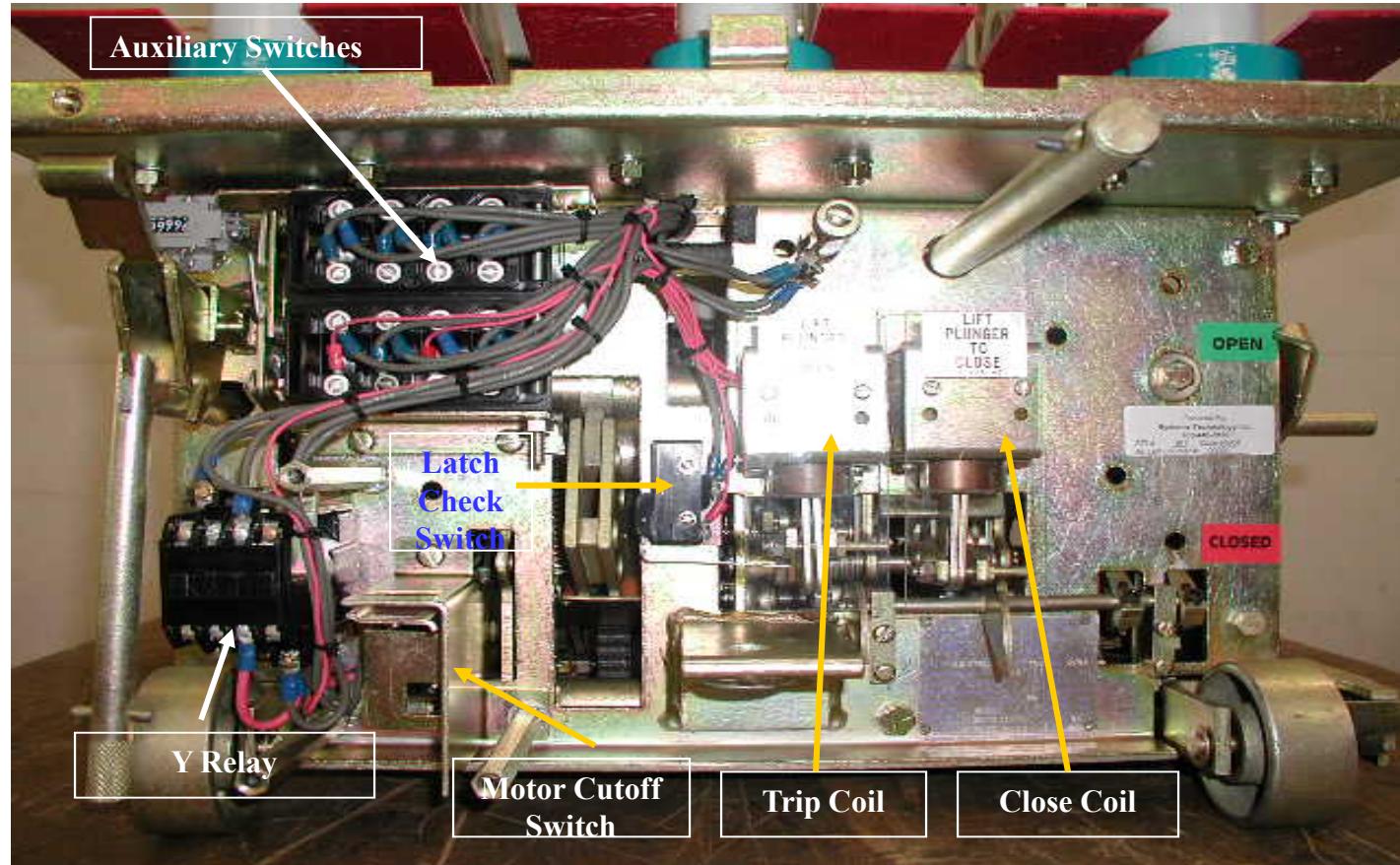
Front Plate



The following components are mounted on the front panel

- Auxiliary Switches
- Spring Release and Shunt Trip Coil
- Control Relay
- Motor Cutoff Switch
- Latch Check Switch
- Resistor

Front Plate



NRC bulletins and Information Notices



- IN # 96-50- Issued to address the “Failure to Close” of a DHP breaker because of a worn Levering-In device. The licensee had a false indication that the breaker was fully RACKED IN when it was not. This was due to a worn Levering-In device that had worn key ways and a cracked tube. The licensee Maintenance Procedure did not address the inspection or cleaning of the device. The device was redesigned by the OEM to ensure reliability.

NRC bulletins and Information Notices



- IN # 98-38- Issued to address general Maintenance and Lubrication Issues with circuit breakers. At a Nuclear Plant a Westinghouse DHP breaker “Failed to Open” when shutting down a pump. This was the second such failure mode in a 2-week period on the breaker type at the same plant. Teams from the NRC and Licensee assembled to determine the cause of the failure.
- After the investigation was complete it was determined that improper maintenance and lack of lubrication in key areas were the root cause of the failure.

NRC bulletins and Information Notices



- Part 21 Report 1998-17-5- the report addresses the anomalies found on 4 different breakers with a similar failure mode. The anomalies were all related to the breaker Auxiliary switches. In particular the auxiliary switch linkage. On two of these breakers the link was bent and on the other two were cracked at the actuator stud. These links were missing the E-Clip retainers as well. It was determined that the link was too long for the intended application. Since the link arm damage would keep the breaker from operating properly it met the criteria for Part 21 Report.

NRC bulletins and Information Notices



- Part 21 Report 1998-71-1- Issued due to the intermittent “Failure to Close” of a breaker during receipt inspection. It was determined that the Trip Latch gap was not in proper adjustment and ratchet bushing of improper size. The breaker had just been overhauled at a Non-OEM service shop and was one of three that failed receipt inspection. Since the breaker was failing intermittently and it could have been put into service in a safety function, the Part 21 report was issued.

NRC bulletins and Information Notices



- Part 21 Report 1996-85-1- this report addresses the Motor cutoff switch and the spring-loaded actuator assembly for the switch. Upon investigation it was found that the Motor Cutoff switch contacts were reading a high resistance. It was also found that the actuator assembly was bound by dirt and excessive friction on the sliding assembly. Since the cutoff switch serves the function of shutting the motor off and provides a permissive close path for breaker operation it was a Part 21 reportable.

DESIGN UPGRADES



- Operating Rod: The original operating rods were a ceramic molding with lead inserts that held the threaded upper portion and the pivot block on the bottom. The newer design is a molded insulating composite with the end metal components as an integral part of the molding.
- Levering-In device: The Levering-In device has also been upgraded. The old style was a racking tube with a single keyway for a couple of rectangular woodruff keys on the racking shaft. This design had a tendency to crack at the front keyway and the woodruff keys would shear. On the newer design, the racking tube has two keyways and the racking shaft has solid groove pins the go completely through the shaft to engage the keyways to improve torque when Levering-In or out.

DHP LUBRICATION



- During an overhaul, any non-current carrying part is lubricated with Dow BR-2 Plus grease or Molybdenum Disulphide (Westinghouse # 53701QB). It is a graphite-based lubricant that is dark gray or black in color. It is somewhat fluid grease that adheres well to its components. For the current carrying parts, thick graphite grease, Westinghouse # 53701AN is required.